SS-H-3

HIGHWAY ACCIDENT REPORT

Adopted: December 18, 1968

INTERSTATE BUS--AUTOMOBILE COLLISION

INTERSTATE ROUTE 15

Baker, California

March 7, 1968

NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
WASHINGTON, D. C.
20591

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FOREWORD

This report and determination of probable causes of the occurrence are based upon information contained in reports of investigation conducted by the California Highway Patrol, the Bureau of Motor Carrier Safety of the Federal Highway Administration, a Trauma Research Team from the University of California under contract to FHWA, the personal observations of a Board Member who visited the scene, and data gathered independently by the Board. The recommendations contained herein are those of the Safety Board.

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SYNOPSIS

On March 7, 1968, at 3:50 p.m., a 1964 Chevrolet two-door sedan driven by a man under the influence of alcohol and carbon monoxide, traveling west (wrong way) in the eastbound lanes of Interstate 15, 3 miles east of its intersection with California route 127, near Baker, California, collided with an interstate bus. Both vehicles were being driven at normal freeway cruising speed.

The bus overturned and was subsequently gutted by fire, resulting in the death of 19 of the 30 passengers. The 11 survivors suffered injuries that varied from minor to severe.

The automobile driver was killed instantly by impact forces and then ejected from the car. The automobile caught fire from the bus fire and was also gutted. ( )

Just prior to the accident, the bus driver, in the process of passing a slower moving eastbound vehicle, suddenly realized that the vehicle 150 to 200 yards ahead of him in his lane of traffic, was traveling toward him. The bus driver made a severe brake application and steered hard to his left toward the wide, clear median, in an unsuccessful attempt to avoid a collision.

The automobile driver, described by his roommate as "too drunk to drive," left Baker at approximately 3:40 p.m., driving east towards Las Vegas on Interstate 15. At some point east of Baker, the driver reversed his

direction of travel from eastbound to westbound so that he was then driving in the wrong direction on the eastbound roadway. It was too late when he realized that the eastbound bus was approaching in the same lane. He made a severe brake application and steered hard to his right toward the median. His evasive action was too late to avoid the collision.

Rapid propagation of the ensuing fire and inaccessibility of escape facilities gave the passengers in the middle of the bus little or no opportunity to be evacuated or rescued.

Probable Cause:

1. The Collision was caused by the driving of an automobile the wrong way on a divided highway, colliding head-on with an interstate bus being driven in the proper direction.
2. The Injuries to the bus occupants were caused by the forces of impact and subsequent bus overturn in the absence of crash injury prevention facilities such as occupant safety belts.
3. The Fire was caused by power-steering oil being discharged under high pressure from a broken fitting damaged by the collision, and ignited by exposed electrical circuits in the front of the bus. This fire then ignited the diesel oil spilled from the ruptured fuel tank of the bus.
4. The 19 bus passenger Fatalities were caused by the rapid propagation of fire and inaccessibility of escape facilities,

coupled with injuries and disorientation, preventing escape or rescue of the non-fatally injured bus passengers.

Contributing causes to the occurrence of the collision were:

1. The automobile driver was under the influence of alcohol and carbon monoxide, resulting in his failure to realize that he was on a one-way divided highway and not on a two-way highway.
2. Lack of traffic control devices (signs, signals, markings) between entrance and exits to the highway in the vicinity of the accident to advise the automobile driver of the proper direction of travel.
3. Failure of the automobile driver to react to the danger of the approaching bus in sufficient time to take adequate evasive action.
4. The fact that the bus driver did not identify the direction of travel and potential danger of the wrong-way vehicle in sufficient time to permit him to take adequate evasive action.

I. FACTS AND CIRCUMSTANCES

A. Description of Accident

1. Events to Moment of Collision

The bus, on a through schedule between Los Angeles, California, and Las Vegas, Nevada, departed from the Los Angeles terminal at 12:01 p.m., March 7, 1968, with 30 passengers on board. In accordance with company policy, it was operating with its headlights burning. The bus passed the second of two interchanges serving Baker, California, at approximately 3:45 p.m. Continuing eastbound on Interstate 15, in the outside (right) lane, the bus came upon a slower-moving vehicle, a pickup truck pulling a camper trailer, and changed to the inside (left) or passing lane, to overtake and pass this vehicle. The bus, traveling at 60 to 65 m.p.h., slowly pulled abreast of the vehicle. The bus was in the passing lane, in the process of passing this vehicle, for a period of a minute or two before the collision.

Suddenly, the bus driver realized that the vehicle in his lane, 150 to 200 yards ahead of him, was not traveling in the same direction but was driving in the wrong direction, coming towards him. Due to the speeds of the two vehicles and the short distance between them, there was insufficient time for the bus driver to take adequate evasive action to avoid a collision.

One passenger, who identified himself as a race car driver, was seated on the left side of the bus at the aisle, two sections behind the bus

driver. This passenger indicated that he did not trust other people's driving; therefore, he was continually monitoring the bus driver and the roadway. When he saw the wrong-way driver approaching, he did not think that the bus driver had observed him. He was just starting to yell at the driver when he saw the driver begin to pump the brakes and sharply turn the bus toward the median strip.

Deciding that he would be unable to move to his right because of the slower-moving vehicle, the bus driver made a severe brake application and steered hard to his left toward the wide-clear median. The rear wheels of the bus left tire marks on the pavement, 123 feet for the right wheels and 47 feet for the left rear wheels, to the point of impact. At the moment of impact, the speed of the bus had been reduced to between 20 to 30 m.p.h.

Michael Leo Barry, the driver of the wrong-way automobile, left Baker at approximately 3:40 p.m., headed for Las Vegas, which is 94 miles east on Interstate 15. The driver had been drinking for a period of 6 1/2 hours prior to the accident, and in the opinion of those who observed him and were with him, he was intoxicated.

The driver of the wrong-way automobile was employed as a short-order cook by Pike's Cafe in Baker. He reported for work on the day before the accident (March 6), and was not allowed to work because it was felt he was intoxicated. He returned to Pike's Cafe at 9 a.m. on the day of the accident. He was still in an intoxicated[1/] condition and was suffering from a "hangover" which was so severe that he could not hold a cup of coffee in his hand. He

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1/ See Chapter III, Analysis of Causal Factors, Section 2, pages 26 through 30.

told the manager that he wanted to quit his job and be paid off, but was told to go home and sleep it off and to come back at 2:30 p.m.

Between 9 a.m. and 2:30 p.m., the driver consumed a quart of wine and drank at least two, and possibly more, cans of beer at the local bus station.

Accompanied by his roommate, he returned to Pike's Cafe at 2:30 p.m. and was given the pay he had coming. They went to a local bar where Barry drank at least two more cans of beer. While they were at the bar, Barry left to go to the trailer to pick up some records he wanted to return to a girl friend in Las Vegas, and then returned to the bar. The roommate reported later that during this visit to the trailer, Barry stole $48 of his personal funds. They separated and Barry was last seen sitting in the automobile in front of the bar at about 3:40 p.m. This time could not be verified.

During the day of the accident, Barry drove about the town of Baker. Those he came in contact with were cognizant of his intoxicated condition, and several people knew that he intended driving to Las Vegas. He was described as mean drunk, argumentive, and loud. A fellow employee, and Barry's roommate declined to accompany him to Las Vegas with the comment that Barry "was too drunk to drive." Of those who were cognizant of his condition, no one except his roommate made any effort to dissuade or prevent Barry from driving about town or to Las Vegas. The manager of Pike's Cafe admonished him for the reckless manner in which he drove in the parking lot, but did not suggest that

he not drive in his condition. Police services were available if anyone wanted them. Baker has a constable and access to the sheriff and Highway Patrol.

At about 3:40 p.m. Barry left Baker for Las Vegas. At some point east of Baker, Barry reversed his direction of travel from eastbound to westbound so that he was then driving in the wrong direction on the eastbound roadway. This reversal of direction of travel could have been accomplished in either of two possible maneuvers. These are discussed in Chapter III, Analysis of Causal Factors.

Between the unknown point where he changed his direction of travel and the point of impact (this distance is known to have been at least 3 miles), the wrong-way vehicle forced at least five eastbound vehicles to take evasive action in order to avoid it. Five witnesses testified that they were driving east on Interstate 15, and that they saw the wrong-way automobile when it was 2 to 3 miles east of the point of collision. Each encounter was separate from the other. These vehicles were in the inside (left) lane, attempting to pass slower-moving vehicles, when they saw the automobile approaching them. They saw the vehicle while it was far enough ahead of them to enable them to reduce speed, change lanes to the right, and avoid a collision. The drivers of these vehicles also had time to try to attract the wrong-way driver's attention (blowing horns, flashing headlights, waving arms, shouting) to the fact that he was driving in the wrong direction. All of these efforts were to no avail. The witnesses said the wrong-way driver was driving at highway speed (70 m.p.h. posted

speed limit) and acted unconcerned "as though he was out on a Sunday afternoon drive."

As the driver approached the eastbound bus, he apparently realized that the bus was not going to get out of his way. He made a severe brake application and steered to his right toward the wide, clear median in an unsuccessful attempt to miss the bus. The car left tire marks on the pavement, 84 feet for the left wheels and 22 feet for the right wheels, to the point of impact. At the moment of impact, the speed of the automobile had been reduced to between 50 and 60 m.p.h.

2. The Collision Phase

The bus and automobile collided head-on as indicated by damage to the front of the bus from its left headlights through the right front corner (Illustration 1), and to the frontal area of the automobile.

At the moment of impact, the bus was being steered to its left and the automobile to its right, resulting in a collision at an oblique angle. The longitudinal forces at impact resulted in vehicle deformation and deceleration. Because of the weight difference, the automobile suffered much higher deceleration and deformation than the bus. The automobile was driven backward approximately 45 feet by the bus and was rotated in a clockwise direction (as seen from above) along the right side of the bus. As the bus slid to a stop in the sandy median, it overturned onto its right side, perpendicular to the roadway, 53 feet from the point of impact. (See Illustration 2.)

The front of the bus was severely damaged by the impact in increasing severity from the left through its right front corner, primarily in the area below its windshield. The right front wheel assembly, including suspension members, was pushed rearward through a bulkhead, penetrating and compressing the fuel tank (located immediately to the rear of the right front wheel well), and contributing to damage and distortion of the plywood floor of the passenger compartment. The fuel tank contained approximately 115 gallons of diesel fuel. The battery compartment, which was located immediately to the rear of the fuel tank, was also partially crushed and displaced. Both sections of the windshield were ejected from their mountings upon impact. The overturning motion of the bus did not contribute materially to further mechanical damage to the bus. The seats were not dislodged from their floor anchorages as a result of the collision.

The full front of the automobile was crushed rearward, with its general alignment changed, so that the front area of the body and frame was deflected to the right. There was severe buckling damage to the right side, and impact damage to the left side, with the left door assembly protruding outward and downward. The roof was damaged and the trunk lid buckled. The two front tires were ruptured and torn by the impact. The left rear tire was shredded during the lateral motion of the automobile following impact, and the right rear tire remained inflated. The gasoline tank was not damaged or dislodged from its mountings, and examination following the accident disclosed that it contained approximately 15 gallons of gasoline.

The left rear window was down, the left front window was down 4 to 5 inches, the right front window was up, and the right rear window was damaged to such a degree as to prevent a determination. The glass in these windows and the windshield was broken.

The interior of the automobile was subjected to intense fire, fueled by splashed diesel fuel from the bus. All combustible materials, such as upholstery, interior linings, floor mats, plastic items, and the spare tire which was in the back seat area were consumed by fire. A small portion of the trunk area behind the rear seat was burned. There was no evidence of any fire found in the heavily damaged engine compartment.

The left exhaust manifold of the automobile had a hole approximately 1 1/4 inches wide and 3 inches long located in its top frontal area.

The bus driver and passengers in the bus were unrestrained in their seats. The bus, like typical intercity buses, was not equipped with seat belts. The passengers and the bus driver were thrown forward and slightly to the right upon impact. Due to the mass of the bus and the partial collapse of its frontal area, they experienced fairly low rates of deceleration.

When the bus veered sharply to its left and then overturned onto its right side, some of the right windows were broken as passengers lurched and fell against them. During the process of overturn, the bus body was twisted causing some of the emergency exit type windows to be sprung open. Portions of bodies, such as legs, arms, and hands,

protruded through the window openings. As the bus came to rest on its right side, at least three persons were pinned by the weight of the bus lying on their protruding extremities. As the bus turned over onto its right side, those passengers who were seated on the left side were thrown toward the right side. An evaluation of the injuries sustained by the surviving passengers indicated that one was critical, five were moderate, and five were minor.

Upon impact, the bus driver was thrown forward against the steering wheel and instrument panel and then toward the right side of the bus. He suffered a broken leg, one broken rib, and second-degree burns to both hands. His injuries prevented his rendering any assistance to the passengers in their attempts to escape from the bus interior.

Upon impact, the automobile driver struck the steering wheel and column, which were forced upward, the dashboard, and the left A-pillar, and was ejected through the left door as the automobile rotated along the right side of the bus. He was killed instantly upon impact. His body was found near the rear of the bus, adjacent to its roof. The automobile was equipped with seat belts which were not in use at the time of the accident. The coroner's report stated that death was immediate and resulted from multiple lacerations of the heart from fractured ribs. His body subsequently received second- and third-degree burns of the head, hands, and forearms as a result of the ensuing fire.

3. Events Following Collision

During the collision phase, fire immediately broke out in the front area of the bus, fueled initially by vaporized power-steering oil, and shortly thereafter by diesel fuel. The power-steering oil was discharged from a fitting at the base of the bus steering column which was broken in the collision. (See Illustration 3.) The diesel fuel was sprayed, splashed, and spilled over a large area of the bus, including the baggage and passenger compartments. The fire spread and grew rapidly in intensity.

The bus driver and six passengers escaped through the right windshield area, some with assistance. Five passengers escaped through the rear window of the bus which was opened forcibly by one of the passengers, who then rendered assistance to others.

The passengers who were seated near the front and near the rear of the bus, and on the left side, comprised the majority of the escapees. Of 11 surviving passengers, nine had been seated on the left side of the bus within four rows of the front and three rows of the back. The two surviving passengers in the right-hand seats were seated in the aisle seats of the first and fourth rows. (See Illustration 4.)

The 19 passengers who did not escape, either due to injuries sustained, shock, or disorientation, combined with limited routes of escape, were quickly overcome by smoke, lack of oxygen, and fire. They died in the bus.

Autopsies were not performed on the nonsurviving passengers. The intense fire damage to the victims made normal identification impossible.

During identification procedures, a pathologist assisted the identification team. He partially examined 12 bodies and observed fractured extremities but no injuries which, of themselves, would have been fatal.

B. Description of the Accident Site

1. The Highway - Interstate 15

The accident occurred on Interstate Highway 15, the main arterial route between Los Angeles, California, and Las Vegas, Nevada. It has a high accident frequency rate. The accident occurred in the eastbound lane, 3 miles east of the intersection of Interstate 15 and California Route 127, near Baker, California, which is located 192 miles northeast of Los Angeles, California.

The highway at this location is a full four-lane, divided freeway, with two eastbound traffic lanes. The roadway runs generally east and west, is predominantly straight, and has a gradual upgrade to the east. The surrounding area is desert and there are no buildings, trees, or other obstructions to limit the visibility. (See Illustrations 5 and 6.)

The roadway consists of a 24-foot asphaltic concrete pavement, a 10-foot blacktop shoulder on the right, and a 2-foot blacktop shoulder on the left. The eastbound roadway is separated from the opposing westbound roadway by a 78-foot, sandy median divider which conforms to the contour of the roadway. There were no surface defects in the roadway. At the time of the accident, 3:50 p.m., the atmosphere was slightly overcast, with a light haze. Due to the overcast condition, the sun did not create a visibility or glare problem. There had been no recent precipitation. The

temperature at the time of the accident was 59°. 3/

The nearest point of entrance to or departure from this highway is 1 mile west of the accident site and consists of controlled access freeway-type on-and-off ramps serving Baker.

2. Traffic Control Devices

The maximum speed authorized is posted at 70 m.p.h.

Pavement markings on the eastbound roadway of Interstate 15 consist of a 4-inch skip white centerline with 9-foot segments of painted line separated by 15-foot unpainted gaps.

"Wrong Way" and "Do Not Enter" signs, supplemented by white directional arrows painted on the road surface, are in place at the Baker off-ramp and entrance. (See Illustration 7.)

The signs and directional arrow markings present at these locations were devised by the State of California to reduce the propensity toward wrong-way movements. 4/ Their effectiveness has been demonstrated by a reduction of wrong-way movements at interchanges throughout the State of between 60 and 70 percent. 5/ (See Appendix 2.)

3/ Recorded by the FAA Weather Station, Daggett, California, located some 50 miles west of Baker, 3-7-68, 3:58 p.m.

4/ Wrong-Way Driving (Phase II), State of California, Highway Transportation Agency, Department of Public Works, Division of Highways, Traffic Department, February 1965.

5/ Wrong-Way Driving (Phase III), State of California, Highway Transportation Agency, Department of Public Works, Division of Highways, Traffic Department, June 1968.

C. Condition and Types of Bus and Automobile

1. The Bus

The bus was a 1966 Challenger, Model MC 5A, manufactured by Motor Coach Industries, Inc., Pembina, North Dakota. The overall length of the vehicle was 35 feet, with a wheel base of 261 inches. The height of the center of gravity of this bus was estimated to be 33 inches above the ground level at the time of the accident. The coach is equipped with an air-ride system which compensates for the load on the bus and maintains the vertical center of gravity at or near 33 inches. Its loaded weight was 28,733 pounds. It was equipped with a rear-mounted diesel engine which was fueled from a 144-gallon capacity aluminum fuel tank located in a compartment behind the right front wheel well. Compartmentalized directly behind the fuel tank were the two-level battery rack and the 212 cubic-foot luggage area. The flooring of the passenger compartment was constructed of five-ply plywood, one-half inch thick. The seats are bolted through the plywood flooring by means of a cap screw and nut combination, with a three-inch diameter metal plate under the plywood at each anchorage.

Besides the outward-opening door, located at the right front, for boarding and alighting purposes, this bus had eight large, wide windows which were hinged at the top, opening outward to provide passenger escape under emergency conditions. The sash was held in the closed position by means of three spring-loaded latches attached to the window moulding.

Pulling up and out at any point on the moulding would allow the windows to be pushed open. Engraved instruction plates, mounted below each window adjacent to each row of seats, provided the following information: "In emergency, all side windows can be used as exits. Jerk out and up anywhere on the moulding and push out on window."

In addition, the rear center window was designed for emergency escape and operated by pulling up on the bar at the bottom of the sash and pushing out on the window. Instructions for emergency use are also provided below this window. The two-section windshield was also designed for emergency escape, with its removal facilitated by heavy outward impact.

The bus was designed to seat 39 passengers: one to a seat, two seats to a section, in two rows of nine sections, each; and one to a seat, three seats to a section, in one row located at the left rear of the vehicle, adjacent to a lavatory located at the right rear of the vehicle.

An examination of the bus maintenance records at the Los Angeles terminal garage indicated that the bus had been driven approximately 250,000 miles and had received routine maintenance.

The bus driver indicated that he had experienced no malfunction or difficulty in the operation of the bus, and that it was in excellent condition prior to the accident.

Examination of the remains of the bus disclosed that the rear tires had original treads, with configuration depths from 11/32 to 13/32 of an

inch; the right front tire was destroyed by fire; and the left front tire was of original tread, with a configuration depth of 19/32 of an inch. An examination of the brakes disclosed no cracks or deformities, and brake linings were found to be of adequate thickness.

2. The Automobile

The automobile was a white 1964 Chevrolet Impala two-door sedan, equipped with a 327 cubic-inch V-8 gasoline engine and seat belts. It weighed 3,490 pounds.

The spare tire was being carried, unanchored, in the rear seat area of the car.

The car was registered in the name of a female resident of North Las Vegas, Nevada, and bore Nevada license plate No. GM 9886. The car was reputed to be in good mechanical condition with no noticeable defects.

D. The Background, Experience, and Condition of the Drivers

1. The Bus Driver

The bus was driven by Kenneth Leroy Burkhard, 41 years old, of Long Beach, California. He held a California chauffeur's license, No. B324203, and a physician's certificate, dated March 11, 1965, which indicated that at the time of examination, he was physically qualified to drive motor vehicles in operation, subject to the Federal Motor Carrier Safety Regulations. The examination certificate is good for a period of 3 years, and was to expire on March 11, 1968.

He had been employed by the carrier since May 11, 1956, and had been assigned to the Los Angeles-Las Vegas run for almost 12 years. According to company records, he had not experienced any chargeable accidents and was eligible for a 12-year safety award. Company officials rated Burkhard an excellent driver and a steady, conscientious employee.

Burkhard had no record of traffic convictions in California, Nevada, or on file with the National Traffic Safety Data Center.

Burkhard was in good health and had no financial or domestic problems.

Burkhard was off duty for more than 24 hours, and had slept 10 hours prior to reporting for duty on the day of the accident. At the time of the accident, he had been on duty approximately 4 hours.

2. The Automobile Driver

The driver of the automobile was Michael Leo Barry, 39 years old. For a week prior to the accident he resided in a house trailer in Baker.

Barry held a Montana driver's license, No. B290109, issued June 13, 1966, and expiring on his birthday, January 9, 1968, 2 months prior to the accident. The expiration date is stamped on the upper left-hand corner of the driver's license.

The Montana Highway Patrol record of driver's license examinations indicates that Barry was first examined for his ability to drive and knowledge of rules of the road on May 31, 1966. He failed the written test on the rules of the road. He was re-examined on June 13, 1966, and passed with the minimum score of 75. The records of the Driver's License

Division of the Montana Highway Patrol indicate that there has been no renewal of Barry's license since its expiration date. At the time of the accident, he was driving on an expired Montana driver's license.

The application form completed by Barry gave his address as 706 North 24th Street, Billings, Montana, and described the applicant as a white male, 5 feet 10 inches in height, weighing 165 pounds, and having brown eyes and brown hair. The application indicated that Barry had no previous license to drive, that he never had a license suspended or revoked, that he was then married, and that he was employed as a cook.

The National Traffic Safety Data Center has no record of this driver. Inquiries of all the States in which Barry is known to have resided produced no information of previous driver's licenses having been issued to him. This search produced evidence of only one traffic arrest, a conviction for a speeding offense in Nevada, on February 13, 1968, more than a month after his driver's license had expired. It is not known why his expired driver's license did not come to the attention of the authorities at that time.

Barry had a criminal arrest record dating back to 1953, including five arrests for passing bad checks, two for public intoxication, one for burglary, and one for grand larceny. On December 10, 1962, under the alias of Raymond L. Decker, Barry was fined $25 and spent 5 days in jail after a conviction for being drunk and vagrant in San Bernardino, California.

Barry, a habitual, heavy drinker of alcoholic beverages, has had an alcohol problem for quite some time. His family described him as an unstable personality. He was depressed over his failure to get a song published. Because of his background and unusual driving actions, the possibility that Barry consciously committed suicide was considered. Pertinent factors contemplated were:

1. He asked to get his job back when he got straightened out.
2. He had stolen some money from his roommate.
3. He had placed some phonograph records in the automobile to return to a girl friend in Las Vegas.
4. He had asked others to accompany him on the trip.

A chemical analysis performed on a blood sample taken from Barry's body during an autopsy conducted 48 hours after the collision (see Item No. 2 on page 28) determined that there was a blood-alcohol content of .09 percent by weight and a 21 percent carbon monoxide saturation.[1/] This condition impaired his ability to make sound judgments and to drive a motor vehicle safely.

The blood sample used in the chemical analysis was "scooped" from the chest cavity of the driver's body. The heart had been severely lacerated, and blood vessels had drained and collapsed by the time the autopsy was performed.

1/ Coroner San Bernardino County, Autopsy Report No. A-213-68, conducted 3-9-68, re: Michael Barry, Jr., prepared by Dr. Wayne Scott, Pathologist, Root-Scott Medical Laboratory, San Bernardino, California, undated.

II. APPLICABLE LAWS AND REGULATIONS

A. Motor Vehicle Operation

1. California Vehicle Code

Section 21651, governing the use of public roads, states: "It is unlawful to drive any vehicle upon any highway which has been divided into two or more roadways by means of intermittent barriers or by means of a dividing section of not less than two feet in width either unpaved or delineated by curbs, lines, or other markings on the roadway except to the right of the barrier or dividing section, or to drive any vehicle over, upon, or across the dividing section, or to make any left turn or semi-circular or U-turn on any such divided highway, except through an opening in the barrier designated and intended by public authorities for the use of vehicles or through a plainly marked opening in the dividing section."

Section 21653 states: "No person shall operate or move a vehicle upon a street or highway designated and signposted for one-way traffic in a direction opposed to that indicated by the designation or signpost."

Section 23102, which covers driving while under the influence of alcohol, states in part: "It is unlawful for any person who is under the influence of intoxicating liquor, or under the combined influence of intoxicating liquor and any drug, to drive a vehicle upon any highway. ..."

Sections 13353 and 13354: The State of California has an implied consent law; however, presumptive levels of the percent by weight of

alcohol in a person's blood have not been established by the State of California to determine at what degree a person is legally under the influence of intoxicating liquor.

Under an implied consent law, a condition is attached to the privilege of driving a motor vehicle upon the highways of a State, and every motorist is deemed to have given his (her) consent to a chemical test of his (her) blood, breath, or urine, to determine blood-alcohol concentration if charged with driving while in an intoxicated condition. A driver so charged may refuse to submit to a test and no test will be given, but his privilege to drive within the State is revoked. (See Appendix 5.)

Section 21350 gives basic authority to the Division of Highways to place and maintain traffic control devices. In order to carry out this responsibility, the Division of Highways adopted, and continually revises, a Planning Manual of Instructions - Part 8, Traffic. The standards in this Manual conform substantially to those used nationally in the Manual on Uniform Traffic Control Devices for Streets and Highways.

Section 1-106 of the Planning Manual provides in part for research related to highway safety and the development of appropriate standards.

Section 8-503.30 of the Planning Manual establishes the policy that "Wrong Way" signs "be installed on all exit ramps ... facing wrong-way traffic."

The Planning Manual also provides for the installation of signs and markings at entrance locations advising drivers of the correct direction of travel. There is no authority or instructions for installation of traffic control signs and markings at other points.

2. Federal Regulations: Department of Transportation

Standards for traffic control devices are set forth in the Manual on Uniform Traffic Control Devices for Streets and Highways. This Manual was concurred in by the Federal Highway Administrator on November 26, 1960, in accordance with Title 23, U.S. Code, section 109(d). A memorandum dated July 25, 1962, from the Deputy Federal Highway Administrator makes the use of this Manual mandatory in the case of all projects constructed with Federal-aid fund participation.

Section 1B-26 of the Manual prescribes that a "Do Not Enter" sign "shall be conspicuously placed in the most appropriate position at the end of a one-way roadway or ramp to prohibit traffic from entering the restricted section. It should normally be mounted on the right-hand side of the roadway, facing traffic entering the roadway or ramp in the wrong direction. A second sign on the left-hand side of the roadway may be justified, particularly where traffic may be approaching in a turn ..."

Section 1B-28 of the Manual states that a "One Way" sign "should always be used, where applicable, and may be supplemented by a Turn Prohibition sign."

The Manual further states that "One Way signs are not ordinarily

needed on the one-way roadways of divided expressways, where the design of interchanges indicates the direction of traffic on the separate roadways."

Section 1B-16 of the Manual states that a Turn Prohibition sign "is not needed at a ramp entrance to an expressway where the design is such as to indicate clearly the one-way traffic movement on the ramp."

The Acting Federal Highway Administrator issued Instructional Memorandum 21-6-67, dated February 9, 1967, relative to signs and pavement markings to avert or redirect wrong-way traffic movements. This memorandum cited the serious nature of the wrong-way problem and directed that the Bureau of Public Roads "advise the States that we recommend the installation of additional signs and markings ..." A copy of this memorandum showing specific signing and pavement marking recommendations appears in Appendix 3 of this report. This is not a Federal regulation, but is a recommendation that invites voluntary compliance by State highway officials.

Operations involving the transportation of passengers for compensation in interstate commerce by motor vehicle are subject to the Motor Carrier Safety Regulations of the Federal Highway Administration. The safety regulations, found in 49 Code of Federal Regulations, Parts 290 to 296, include requirements concerning driver qualifications, the driving of motor vehicles, parts and accessories, accident reporting, hours and service of drivers, and vehicle inspection and maintenance.

The following is a partial listing and analysis of sections of Motor

Carrier Safety Regulations which in some manner pertain to this accident:

§291.9, "Periodic physical examinations of drivers," states "Every driver shall be physically reexamined at least once in every 36 months and no person shall drive nor shall any motor carrier require or permit any person to drive any motor vehicle unless such person shall have been physically examined and certified by a licensed doctor of medicine or osteopathy as meeting the requirements of §291.2. ..."

§293.84, "Floors," requires flooring to be of substantial construction, free of all unnecessary holes and openings, and maintained so as to minimize the entrance of fumes, exhaust gases, or fire. There is no restriction against the use of wood as a flooring material.

§293.93, "Buses, marking emergency doors," requires emergency doors on buses to be marked and identified by a red electric lamp when buses are so equipped. The regulations do not require the installation of such a door.

§293.61, "Window construction," includes requirements on the adequacy of means of escape through bus windows, including a specified number of square inches of escape area per passenger and driver seating space. Also included is a push-out window requirement when openings are not glazed with laminated safety glass. No requirement is included in the regulations concerning escape means through floors or roofs in buses.

§293.63, "Windows, markings," requires push-out and escape windows glazed with laminated safety glass to be identified with appropriate wording to indicate they are escape windows and the methods to be used for obtaining emergency exit.

§296.2, "Inspection and maintenance," includes a requirement that all push-out windows and emergency doors on buses be tested once every 90 days.

§293.65, "Fuel systems," prohibits the location of the fuel tank forward of the front axle and prohibits placement of the tank within the passenger-carrying portion of any bus unless securely sealed off from such compartment by means of a substantial metal cover. The tank is also required to be of "substantial construction."

There is no Federal regulation establishing criteria for the anchoring of passenger seats in a bus. There is a current notice of rulemaking in the Federal Highway Administration referring to performance requirements for the installation and attachment of passenger seats in buses (docket 2-11, dated October 1967, titled "Bus Seats").

There is a current rulemaking procedure in the Federal Highway Administration referring to seatbelt requirements for buses (initiated under Part II of the Interstate Commerce Act, docket Ex Parte No. MC-69, dated May 27, 1966) but no decision has been reached as of the date of this report.

III. ANALYSIS OF CAUSAL FACTORS

General

Several salient factors contributed in a causal way to this collision and the subsequent fatal and non-fatal injuries. In order to provide a full understanding of the facts and circumstances of the accident, it is necessary to identify all of the significant factors and their relationship to the accident. This analysis concentrates on those causal factors that are most pertinent in explaining the accident and are related to the corrective measures set forth in the recommendations.

A. Collision Occurred between the Bus and the Automobile

1. The Bus

As the bus proceeded east on Interstate Highway 15, it came upon a slower moving vehicle and moved into the left, or passing lane, in order to pass it. When the bus had moved into a position abreast of this vehicle, the driver suddenly realized that a white automobile was coming toward him in the same lane.

Due to the fact that the bus driver did not recognize the danger presented by the wrong-way automobile until it had approached to within 150 to 200 yards of his bus, he had very little time in which to evaluate the situation, decide what evasive action he should take, take that action,

and avoid the oncoming car. Using a conservative estimate of the speed of the bus as 60 m.p.h. and of the automobile as 65 m.p.h., the closing speed of the two vehicles was 125 m.p.h. or 184 feet per second. Using the closer estimate of 150 yards (450 feet), the two vehicles would close this distance to the point of impact in 2.4 seconds. If the distance was 200 yards (600 feet), the closing time would have been 3.3 seconds.

The longest tire mark left by the bus (right rear wheel) measured 123 feet. The longest tire mark left by the automobile (left rear wheel) measured 84 feet. Each of these tire marks was a result of a combination of braking action and the weight of each of the vehicles being shifted to the outside of its turn.

At the moment of braking, the bus was traveling 60 m.p.h. or 88 feet per second, and the automobile was traveling 65 m.p.h. or 94 feet per second. The average speed of the bus during deceleration to the point of impact was approximately 63 feet per second. The average speed of the automobile during deceleration to the point of impact was approximately 85 feet per second. Using these speeds and the tire mark measurements, it can be assumed that the bus driver started his braking and turning actions approximately 2 seconds before impact, and the automobile driver's actions started approximately 1 second before impact.

It is reasonable to believe that the bus driver's actions, once he

overcame the element of surprise, were quicker and more definite than those of the automobile driver who was driving while under the influence of alcohol and carbon monoxide. According to the bus driver's own statement, his attention was somewhat diverted by the problem of passing the slower moving vehicle; and he did not realize, until it was too late, that the vehicle in front of him, in the same lane, was coming toward him in the wrong direction instead of traveling with him in the same direction.

The automobile driver may have seen the oncoming bus in time to avoid the accident. However, his judgment and driving abilities were impaired by alcoholic and carbon monoxide influence. In this mental state, the fact that five other vehicles had changed lanes to avoid him may have led him to feel that the bus would likewise get out of his way. When he finally realized the true situation, it was too late to avoid the collision.

2. The Driver of the Wrong-Way Automobile was under the Influence of Alcohol and Carbon Monoxide

An autopsy was performed on the body of the automobile driver 48 hours after the accident and indicated a blood-alcohol level of .09 mg%. The blood sample used for the chemical analysis was taken from the chest cavity of the deceased, and not taken from the heart or any of the blood vessels. The blood found in the chest cavity after death was contaminated by other body fluids. This

circumstance was discussed with the pathologist who performed the chemical analysis. He indicated that the blood sample was not pure and, therefore, the blood-alcohol level reading was probably a low estimate.

Using the amounts of alcoholic beverage reported to have been consumbed by the deceased during the 6 1/2-hour period prior to the collision, the following results can be computed:

Known Alcoholic Beverage Consumed	Contents of 100% Alcohol in Drinks Consumed
1 quart of wine = 32 oz	
12.5% alcohol by volume - 12.5 X 32	4.0 oz
4 cans of beer @ 12 oz = 48 oz	
4% alcohol by volume - .04 X 48	1.9 oz
Total alcohol consumed	5.9 oz
Convert alcohol to equivalent 100-proof liquor in order to use the Body Concentration Table - 5.9 X 2	11.8 oz
Interpolate 11.8 oz to mg% of alcohol in the blood for 165-pound man	268.7 mg%
Conservative metabolic rate of 18 mg% per hour for 6 1/2 hours - 6 1/2 X 18	117.0 mg%
Based upon the above computation, the blood-alcohol level should have been conservatively	151.7 mg%

Based upon the above calculation, the blood-alcohol level reading at the time of collision should have been a minimum of 151 mg%. This calculation is based upon a conservative estimate of a metabolic rate.[1/] Barry was described at 9:30 a.m. on the morning of the accident as being

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1/ Blood-Alcohol Chart prepared by the Government of the District of Columbia Department of Motor Vehicles. (This chart uses 15 mg% per hour as the metabolic rate, rather than the conservative value of 18 mg% per hour as used above. If the 15 mg% rate had been used, the blood-alcohol level would have been .19 percent weight/volume.) 12/64 (See Appendix 4.)

in an "intoxicated condition." Whatever blood-alcohol level he may have had at 9:30 a.m. would have to be added to the calculated 151mg% shown above. (151 mg% equals 0.15% weight/volume.)

The Uniform Vehicle Code[2/] defines "under the influence" as follows: "If there was at the time, 0.10 per cent or more by weight of alcohol in the person's blood, it shall be presumed that the person was under the influence of intoxicating liquor."

The Federal Highway Administration Standard 4.4.8[3/] defines "intoxication" and "under the influence of alcohol" as a blood-alcohol concentration of 0.10% by weight or higher.

The chemistry report of the autopsy also indicated a 21% concentration of carbon monoxide. CDR Schulte, MC, USN, in his article "Effects of Mild Carbon Monoxide Intoxication"[4/] states, "Impairment of functions due to exposure to carbon monoxide occurred earliest in the higher centers of the central nervous system and that area (or areas) of the brain which controls some of the cognitive and psychomotor abilities. Impairment is detectable at levels of carboxyhemoglobin below 5%, and

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2/ Uniform Vehicle Code, 1962, Section 11-902(b)3, Persons under the Influence of Intoxicating Liquor, pages 130-1.

3/ Federal Highway Administration Highway Safety Program Standard 4.4.8, Alcohol in Relation to Highway Safety, dated 6/27/67, Section IB(1).

4/ Effects of Mild Carbon Monoxide Intoxication, CDR John N. Schulte, MC, USN, Archives of Environmental Health, 7:524-530, 1963, p. 529-30.

the degree of impairment increases with increasing concentrations of the carboxyhemoglobin in the blood." The above refers to the effect upon the more complex psychological functions involving judgments, and situational decisions, and responses. This indicates that driving abilities of a person under the influence of carbon monoxide would be impaired to a degree in proportion to the percent of concentration.

According to those who had ridden in the automobile previous to the accident, the car was in good mechanical condition. They reported no fumes or indication of exhaust system defects. At the time of the collision, the left rear window was all the way open and the driver's window was open 4 or 5 inches. The automobile is not considered to be the source of the carbon monoxide.

The source of the carbon monoxide is undetermined. Barry could have been exposed to carbon monoxide from one of at least two sources:

a. From his living quarters. Barry and a roommate lived in a house trailer. The temperature was low during the night and, due to the cool weather, the heater was probably on to warm the trailer. The heater has not been examined, but could have been a source of carbon monoxide.

b. From the smoke and fumes of the bus fire. The coroner's and autopsy reports stated the cause of death: "Laceration of heart, immediate, due to fractured ribs, immediate." After impact, during which he received his fatal injuries, he was ejected from the automobile and came to

rest alongside of the overturned bus. As the bus burned, the body received second- and third-degree burns of the head, hands, and forearms. If there were several post mortem reflex gasps as the body lay next to the burning bus, some carbon monoxide could have been taken into the lungs. It is unlikely there was enough taken in to result in a 21% concentration after death.

3. The Automobile was Traveling the Wrong Way on the Divided Highway

The automobile driver left Baker on Interstate Highway 15 traveling toward Las Vegas (east). At some point east of Baker, he reversed his direction of travel from east to west in the same roadway, so that he was then driving west (wrong way) in the eastbound lane of traffic. There are two possibly ways he could have reversed his direction:

a. He could have entered the westbound roadway of Interstate 15 at the Baker Interchange and traveled east (wrong way) in the westbound lanes for an unknown distance, and then driven across the median in a U-turn and proceeded back toward Baker, now driving west (wrong way) in the eastbound lanes; or

b. He could have entered the eastbound roadway of Interstate 15 at the Baker Interchange, proceeded eastbound to an unknown point, then made a U-turn in the roadway and proceeded west (wrong way) in the eastbound lanes.

If the automobile driver entered into his wrong-way maneuver pursuant to "a" above, then the traffic control signs and markings at the Baker off-ramp were ineffective in their application in this instance.

4. Automobile Driver's Ability to Read and React to Traffic Signs, Signals and Markings

Those who came in contact with Barry prior to the accident, described him as being "mean drunk, argumentive and loud." The Board in its analysis of the reported amount of alcoholic beverage consumed by Barry, calculated that his blood-alcohol level was between .15 and .19% by weight/volume, but could have been higher. This, however, does not mean that he had lost all of his faculties, but it does indicate some degree of loss of coordination and judgment, and impairment of driving ability, which takes place well before a person reaches the "intoxication" stage.

There is a difference between being "under the influence" of alcohol and varying degrees of drunkenness. In the common acceptance of the term, "drunkenness" is taken to mean that a person is in a helpless state of immobility, as suggested in the quotation taken from Thomas Love Peacock's (1785-1866) Mistakes of Elphin, Chapter 3:

"Not drunk is he who from the floor,

can rise alone and still drink more;

But drunk is he, who prostrate lies,

Without the power to drink or rise."[5/]

Barry had not reached that state. He was able to drive the automobile about the town of Baker, recklessly, it is to be granted, but he did not have an accident because he was not faced with an emergency. He was able to travel from place to place; talk with people; invite them to go with him to Las Vegas; take money from his roommate's dresser; and to decide to return borrowed records to a girl friend in Las Vegas. Therefore, it is logical to believe that he was able to read, comprehend and respond to traffic control devices, although probably not as well or as quickly as if he were sober.

Since this accident, there has been another accident involving wrong-way driving on the same highway near Baker. The driver in this subsequent accident was sober. So, clearly, there is a need for more effective traffic control devices to advise motorists that they are driving the wrong way on highways of this type. Had such signs been in place along Interstate 15, it is possible that Barry would have reacted to them and avoided the accident. (See Appendix 2, item 7.)

5/ Vehicle Traffic Law, Edward C. Fisher, p. 271, State vs. Myrick, 203 N.C. 8, 9, 164 S.E. 328, 329, (1932). This is also quoted in Chemical Tests and The Law, by Robert L. Donigan, p. 294, published by The Traffic Institute, Northwestern University, 1966.

B. Bus Overturned and Burned

1. Bus Overturn

The bus was steered sharply to the left, and the automobile sharply to the right, before speed was reduced sufficiently to remove inertial forces, tending to move the vehicles in a parallel axis to the roadway. As the vehicles were turning, they collided at an oblique angle. Both factors, combined, increased the centripetal acceleration of the bus front toward the center of its turn.

As the bus was turning, the automobile, after being driven backward 47 feet, traveled momentarily along the right side of the bus, reducing the turning motion of the rear of the bus, while the top portion was unrestrained, resulting in the bus tipping to the right. This tipping action, combined with the loss of stability resulting from the right front wheel being driven backward, caused the bus to turn over 90° onto its right side.

The initial collision impact to the bus produced a relatively light forward impact upon most of the seated passengers. Calculations based on estimated speeds of the two vehicles at impact indicate that the bus would have been slowed from about 25 miles per hour to about 17.0 miles per hour, resulting in a speed reduction of the bus as a whole not greater than that involved in striking a fixed barrier object at 8 miles per hour. (See Appendix I.) The actual decelerations upon passenger seats could not be estimated nor could they be compared with

existing bus crash-test results due to differences in the modes of immediate impact. However, the forward impact was not sufficient to dislodge seats from their attachments to the plywood floor by impact of passenger's body weight.

After the forward impact, the bus turned farther to the left, but the overturn did not occur until the bus had come almost to a complete stop, as is indicated by the fact that the bus did not slide after the side of the bus contacted the ground. The bus had appreciable velocity in pivoting about its right tires in this overturn, and there was a lateral downward force on the bus body as the side contacted the ground, as is indicated by the slight lateral deflection of the bus roof. This deflection may have occurred when the bus rolled a few degrees beyond the flat-on-the-side position, concentrating the load on the upper part of the side of the body briefly, after which the bus settled back on its flat side. It is to be noted that the high position of passenger seats in buses tends to give these seats a greater velocity when striking the ground in overturn than would be felt in a passenger car, for example. Nevertheless, both the initial impact and the following overturn were crash conditions of relatively low impact velocity.

2. Escape Possibilities for Passengers in the Middle of the Bus

There were two conceivable modes of escape for passengers at the center of the bus, both of which were so difficult as to be nearly

impossible. Passengers could have climbed upward, stood on the sides of the chair arms, forced the upper row of windows open, and then climed out onto the side of the bus. Escape from the fire would then have required an 8-foot drop to the ground.

It was also possible for a passenger to move forward or rearward by walking on the side windows, passing through the openings between seat backs and the lower side of luggage rack, which would have been vertical in that position. These openings were quite narrow, and injured passengers were undoubtedly already occupying most of the side windows and the spaces between seat tops and bottom of the luggage rack. Another fore and aft path was offered by crawling along the sides of the seats; however, the vertical clearance here would have been less than 2 feet, and it would have been necessary to bridge a gap about a foot wide at each seat opening.

The degree of injury under non-severe impact conditions can be limited and escape can be facilitated by vehicle design. Perspective on the injurious outcome of this accident can be obtained by comparing it with a somewhat similar accident which occurred at LaGuardia field on September 14, 1960.[6/] This accident was investigated by the Safety

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6/ Civil Aeronautics Board, Bureau of Safety, Report of the Human Factors Group concerning an aircraft accident at LaGuardia Airport, New York, September 14, 1960.

Board's predecessor, the Bureau of Safety of the Civil Aeronautics Board.

In that accident, a commercial turbo-prop transport, carrying 70 passengers, struck a dike while landing, overturned in the air, and struck the ground inverted. The aircraft then slid 900 feet to a stop across runway and unpaved areas. During this sequence, the safety-belted passengers remained in their seats, hanging upside down during the slide. After the aircraft had stopped, the passengers aided each other in releasing their belts, and despite smoke in the cabin, moved about successfully in the inverted cabin. All passengers and stewardesses escaped within 3 minutes, and many passengers brought their hand luggage. About half of the passengers suffered minor injuries, but these were not sufficient to delay evacuation. Shortly after the evacuation, a kerosene fuel fire spread to the cabin and destroyed the forward third of the cabin interior.

The key factors in survival in the aircraft accident were the freedom from incapacitating injury due to the fastened safety belts and strong seats, and the accessibility of escape means to the uninjured passengers.

The bus was not equipped with emergency exits in its roof or floor, and the fire spread too rapidly for all of the passengers to exit from the bus through the front windshield area or the rear window.

3. Possibility of Safety Belts Reducing the Severity of Injuries to Bus Occupants

It is possible that if driver and passenger restraining devices had been provided and used, the occurrence and severity of injuries would have

been reduced. If the passengers on the left side of the bus had not fallen into the luggage rack and on top of the passengers on the right side during the time of turnover, there would have been fewer injuries and much less confusion and disorientation. Passengers restrained in their seats on the left side of the bus may have been able to open and escape through the windows designed as emergency escape routes. If the driver had been restrained in his seat, he would not have been thrown against the instrument panel, nor would he have fallen into the heavily damaged right front corner of the bus as it turned over. Had the driver been less seriously injured, he could have assisted in the rescue of passengers and, because of his familiarity with the bus, been effective in the evacuation of more passengers than were saved. Also, if additional, accessible emergency escape facilities were available, the evacuation and/or escape opportunities of the passengers in the middle of the bus would have been improved.

4. Bus Fire

Fire started in the bus almost immediately upon impact. The fuel source of the initial fire was power-steering fluid under high pressure discharged in a fine mist from a broken fitting at the base of the steering column on the bus. The fluid, #10 lubricating oil, has a flash point of approximately 400° F. when vapors are generated. Due to high torque on the steering, there were probably more than 500 pounds of pressure per square inch generated in the power-steering system at the moment of impact. Such high pressure would cause discharge of the fluid as a fine mist which is highly flammable.

Potential sources of ignition to the flammable vapors were numerous. Some probable sources of ignition in this accident were: (1) the sparks and heat friction caused by the contact between ferrous metals upon impact; (2) the hot brake assembly (surface temperatures on drum and lining can exceed 800° F. as the result of one hard braking effort); (3) the headlights of the bus were burning up to the instant of impact (the temperature of the filaments was in excess of 4,000° F. at the moment the headlight lenses were shattered); and (4) electrical circuits in the front of the bus, including those for the headlights, could have been short-circuited at the time of impact.

The diesel fuel tank was compressed and punctured during the collision phase of the accident. This compression facilitated the spraying of diesel fuel, some of which was atomized, onto various objects, as discussed later. The fuel discharge was also prompted by inertial forces and the overturning of the bus.

It is probable that some of the diesel fuel came into contact with the hot brake assembly of the right front wheel, resulting in vaporization. The most probable source of ignition of the vaporized and atomized fuel was the burning power-steering fluid vapors. The fuel tank was located behind a bulkhead immediately to the rear of the right front wheel well and was constructed of sheet aluminum. The tank was not equipped with any type of interior puncture-resisting bladder, reticulated fiber material, or self-sealing liner.

The fire propagated into and ignited combustible elements within the passenger and baggage compartments. Splashed and sprayed fuel entered both compartments through damaged bulkheads and flooring following the bursting and puncturing of the fuel tank. The floor of the passenger compartment was damaged and distorted by impact forces transmitted backward from the collapsed right front corner of the bus and by the backward movement of the right front wheel assembly.

Upon being covered by diesel fuel, combustible fabrics and plastics in the seats, wall coverings, and the plywood flooring served as wicks for the burning of fuel vapors and also as a fuel for the growing, intense fire.

Other combustible materials such as passengers' clothing, baggage, and package express, served as sources of fuel to the fire.

5. Statistics Relative to Bus Overturn Accidents

Under current procedures, in use by national and State authorities, accidents are classified according to the primary cause, such as: failure to yield right-of-way; ran off roadway; excessive speed; improper lane usage; etc. Secondary causes, or contributing causes, are not included in the identification of the classification. This procedure does not provide for the classification of bus accidents as "overturn" accidents because they are classified according to the event that took place on the roadway and which occurred before the turnover. The lack of such statistics prevents the Safety Board from making any meaningful recommendation in this area.

Consequently, there are no readily available meaningful statistics on bus overturn accidents, and the injuries and/or ejections of passengers. The

Federal Highway Administration (Bureau of Motor Carrier Safety) has investigated several such accidents during this calendar year. An outstanding example is the Carlsbad Cavern Coaches, Salt Flats, Texas, accident on December 16, 1967.[7/] During the accident, in which the bus skidded off the roadway due to "excessive speed for road and weather conditions," the bus turned over several times, and nine of the 16 passengers and the bus driver were thrown out of the bus.

The need for a more detailed analysis of accident events and statistics was recognized by FHWA in the development and distribution of the Highway Safety Standard No. 4.4.10, Traffic Records. This standard requires that each State, in cooperation with its political subdivisions, shall maintain a statewide traffic records system which will identify and classify "Causes and Contributing Factors ..." for accidents.

6. Fatal Injuries to Automobile Driver

The deceleration forces on the automobile were such that fatal injuries were sustained by the driver upon impact. He was thrown forward into the steering wheel and column, the dashboard, and corner pillar, and ejected through the open left front door. He was not wearing the safety belt provided in the automobile. The crushing damage to the automobile and the severe change of direction of travel from forward to being instantaneously driven backward by the decelerating bus, a speed change of approximately 70 m.p.h. (See Appendix 1), resulted in immediate fatal injuries

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7/ FHWA Motor Carrier Accident Investigation Report No. 68-1, Bureau of Motor Carrier Safety, Carlsbad Cavern Coaches Accident at Salt Flats, Texas, on 12/16/67.

IV. CONCLUSIONS AND PROBABLE CAUSE

A. Conclusions

Based on the foregoing analysis of causal factors, the Safety Board has reached the following conclusions:

1. The automobile driver was driving on an expired Montana driver's license.

2. The automobile driver, at the time of the collision, had a higher level of blood-alcohol content that the .09 mg% by weight reported in the autopsy report.

3. The carbon monoxide influence increased the impairment of his driving ability already impaired due to alcoholic influence suffered by the automobile driver.

4. The automobile driver was driving while under the influence of alcohol and carbon monoxide; and his judgment, reactions, and overall driving ability were seriously impaired.

5. The automobile driver did not consciously attempt to commit suicide.

6. Among several people who were aware of the driver's alcoholic condition, and were in a position to dissuade him from driving, only one person attempted to do so.

7. The automobile driver was driving in the wrong direction. Of the two possibilities for driving in the wrong direction, the most likely was that he entered the eastbound roadway of Interstate 15, at the Baker Interchange, proceeded eastbound to an unknown point, then

made a U-turn and proceeded west (wrong way) in the eastbound lane.

8. Traffic control devices to advise motorists of the proper direction of travel were in place at the entrance to the Baker Interchange.

9. There were no traffic control devices or pavement markings in place along Interstate 15, in the vicinity of the accident, to advise errant motorists that they were traveling in the wrong direction.

10. The bus driver's attention was diverted by the problem of passing the slow-moving vehicle; and he did not realize, in time to avoid the collision, that the vehicle in the same lane in front of him was being driven the wrong way.

11. Due to the automobile driver's impaired state, he probably did not realize that he was driving on a one-way roadway of a divided highway.

12. Due to the automobile driver's impaired state, he probably did not realize that the bus was not going to get out of his way until it was too late to avoid the collision.

13. Due to the overcast sky, the sun did not present a vision or glare problem to the automobile driver who was heading due west.

14. The initial source of fuel for the fire was the fluid from the power-steering system emitted under high pressure.

15. The ignition source was one of the following:

a. Sparks and heat of friction caused by contacts between ferrous metals; or

b. Electrical components in use (i.e., wires leading to instrument panel and headlights); or

c. Hot filaments in broken headlights.

16. The atomized and unatomized diesel fuel, which was ejected from the compressed and ruptured fuel tank, was ignited by the burning power-steering fluid.

17. The injuries received by the nonsurviving passengers due to the collision and bus overturn were not fatal.

18. All of the required escape facilities were not accessible to the bus passengers (i.e., the four side windows on each side of the bus). The Safety Board is cognizant of the fact that the National Highway Safety Bureau is working towards the development of a standard in this area.

19. The absence of restraining devices for the driver and bus passengers made possible the increase in severity of injuries and resulted in confusion and disorientation (i.e., to the passengers on the left falling on the passengers on the right side of the bus). Had restraining devices such as lap-type safety belts been available and in use by occupants, it is probable that a greater number of persons would have been able to escape from the bus before the fire.

20. The rapid propagation of fire and inaccessibility of escape facilities when the bus was lying on its side prevented the evacuation or rescue of those passengers in the middle of the bus.

21. The hole in the exhaust manifold of the automobile was caused by the collision.

22. Federal Regulation 293.65, as it applies to bus and diesel fuel tanks, provides only requirements for "construction" and "location," requiring only that tanks be of "substantial construction"; the criteria are not precise and do not control effectively any necessary aspect of construction. The location of the fuel tank complied with the words of the regulation, but the location did not prevent the rupture. Federal Regulation 293.65 is indefinite and inadequate because it does not require any performance tests to determine any specific degree of resistance to external hazards, such as rupture and intrusion.

23. Insofar as it is intended to control fire, Federal Regulation 293.84 does not assure any specific degree of resistance to fire because the words "substantial," "unnecessary," and "minimize" operate to release the designer from being required to provide fully effective fire blocking characteristics. The regulation speaks to design rather than tested performance.

24. Federal Regulations relating to escape facilities for buses (Section 293.61(b), Bus Windows to be Constructed as a Means of Escape; Section 293.63, Window Markings as Emergency Escape Facility; and Section 296.2, Periodic Inspections of Emergency Exits) do not provide adequately for the timely escape of passengers for a predictable condition when a bus is lying on its side, as in this accident.

25. The automobile driver was not wearing the safety belt provided in his vehicle.

26. The automobile driver suffered immediate fatal injuries due to the severity of the impact before he was ejected from the vehicle.

27. Heat from the burning bus, resulting in second- and third-degree burns to the arms and head of the body of the automobile driver, had negligible effect on the blood-alcohol level determined during the autopsy 48 hours after death.[1/]

B. Probable Cause

1. The Collision was caused by the driving of an automobile the wrong way on a divided highway, colliding head-on with an interstate bus being driven in the proper direction.

2. The Injuries to the bus occupants were caused by the forces of impact and subsequent bus overturn in the absence of crash injury prevention facilities such as occupant safety belts.

3. The Fire was caused by power-steering oil being discharged under high pressure from a broken fitting damaged by the collision, and

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1/ Legal Medicine, Pathology and Toxicology, Dr. Umberger, Chapter on Alcohol. Professor Robert F. Borkenstein, Director, Police Administration, Indiana University. Dr. Milton Halpren, Chief Medical Examiner, New York, New York.

ignited by exposed electrical circuits in the front of the bus. This fire then ignited the diesel oil spilled from the ruptured fuel tank of the bus.

4. The 19 bus-passenger fatalities were caused by the rapid propagation of fire and inaccessibility of escape facilities, coupled with injuries and disorientation preventing escape or rescue of the non-fatally injured bus passengers.

Contributing causes to the occurrence of the collision were:

1. The automobile driver was under the influence of alcohol and carbon monoxide resulting in his failure to realize that he was on a one-way divided highway and not on a two-way highway.

2. Lack of traffic control devices (signs, signals, markings) between entrances and exits to the highway in the vicinity of the accident to advise the automobile driver of the proper direction of travel.

3. Failure of the automobile driver to react to the danger of the approaching bus in sufficient time to take adequate evasive action.

4. The fact that the bus driver did not identify the direction of travel and potential danger of the wrong-way vehicle in sufficient time to permit him to take adequate evasive action.

V. RECOMMENDATIONS

1. The Safety Board recommends that the Federal Highway Administrator expedite the proceeding initiated under Part II of the Interstate Commerce Act, docket Ex Parte No. MC-69, dated May 27, 1966, "to inquire into the operations of motor carriers of passengers in order to determine whether it is necessary or desirable to adopt regulations and establish standards which would require carriers to install, provide, and maintain seat belts for the use of passengers and drivers." The experience in this case indicates definitely that restraint of drivers and occupants in their seats under rollover conditions is necessary to reduce initial injury, disorientation, and thus insure more likelihood of timely post-crash escape from the vehicle. This report and the Safety Board's conclusion should be seriously considered by the Federal Highway Administrator in reaching his decision concerning a requirement that seat belts be available in buses. The Safety Board urges that a decision be made on this important matter which had been under consideration for more than 22 months at the time this accident occurred, and more than 30 months prior to the date of this report.

2. The Safety Board recommends that the Federal Highway Administration, in its development of motor vehicle safety performance standards, review all motor vehicle fuel systems, including diesel fuel; and power steering, and brake systems. Also, in the establishment of crash barrier criteria, full consideration should be given to intrusion factors and flammability of fuels and fluids used in these systems.

3. The Safety Board recommends that the Federal Highway Administration review those characteristics of floors intended to be required by Federal Regulation 293.85 (49 Code of Federal Regulations) with a view to rewriting the requirement in terms of specific and verifiable performance tests. This accident reveals that the fire resistance requirement for floors does not insure isolation of fires to any specific degree.

4. The Safety Board recommends that the Federal Highway Administration revise Regulation 293.65 as it applies to liquid fuel tank requirements to specify crash impact resistance to rupture and intrusion in terms of performance tests that are applicable to all types of liquid fuel tanks -- including diesel fuel -- not just gasoline.

5. The Safety Board recommends that the Federal Highway Administration include in its motor vehicle safety performance standards a performance requirement concerned with the prevention or control of discharge from fuel tanks subject to compression ruptures or mechanical intrusion. Consideration should be given to existing means, such as liners of the self-sealing type, flexible bladders, and reticulated foam-filled tanks. A similar recommendation, applying primarily to tank trucks carrying flammable fluids, was made to the Federal Highway Administration in the Safety Board's report, released March 7, 1968, on the railroad-highway grade-crossing accident which occurred in-

Everett, Massachusetts, on December 28, 1966. This recommendation refers to Docket 3-2 of the National Highway Safety Bureau as well as to Motor Carrier Safety Regulations.

6. The Safety Board recommends that the Federal Highway Administration continue its support[1/] of State Highway Department research and application of remedial measures to avert or redirect wrong-way traffic movements at expressway, freeway, and multilane divided highway ingress and egress points. This research effort should be expanded and consideration given to the development and application of measures to avert or redirect wrong-way traffic movements which occur on a roadway at points other than those used for ingress and egress. Directional arrows applied at regular intervals, rumble strips, signs, and other signal systems might be considered.

The Safety Board further recommends that the Federal Highway Administration advise the National Joint Committee on Uniform Traffic Control Devices of the effective measures developed to redirect wrong-way traffic movements which occur on a roadway at points other than those used for ingress and egress; and, urges the National Joint Commission to implement these measures on a National basis in the most expedient manner at its command.

1/ State of California Department of Public Works, Transportation Agency, Report on Wrong-Way Driving, Phases I, II, and III. Prepared in cooperation with FHWA, DOT.

7. The Safety Board recommends that the Federal Highway Administration, as soon as possible, change the basis of its regulatory requirements intended to insure escape from buses so that they are based upon tests of performance of occupants in escaping from buses standing or lying in all basic attitudes. In the development of test criteria, it is suggested that consideration be given to test procedures presently employed by the Federal Aviation Administration for the regulation of the adequacy of escape techniques and systems. Further, consideration should be given to adopting for buses, the airline practice of placing emergency escape in tructions at each passenger location. It is further recommended that necessary regulations be expedited to insure that no new types of buses go into service which have not been tested to insure that all occupants can escape rapidly when the bus is in any of its basic attitudes after a crash. This recommendation refers to Docket 2-10 of the National Highway Safety Bureau, as well as to Motor Carrier Safety Regulations.

8. The Safety Board recommends that the bus manufacturing industry and the motor carrier bus users consider the lesson of escape in this accident, and initiate their own performance tests of the escape capabilities of buses in each of their basic attitudes.

9. The Safety Board recommends that the Safety Programs Services of the Federal Highway Administration develop a program

designed to produce a sense of individual responsibility in the general public to protect the Nation's highways from drinking drivers, enlisting in such a program the aid of the news media, the producers of alcoholic beverages, private and public agencies concerned with highway safety, as well as religious, educational, and civic groups to (a) support law enforcement efforts against and the prosecution of drinking drivers; (b) impress upon the public individually, each person's serious social duty not to drive while under the influence of alcohol; and (c) individually to accept the responsibility of preventing other persons from driving while under the influence of alcohol.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOSEPH J. O'CONNELL, Jr.
Chairman

/s/ OSCAR M. LAUREL
Member

/s/ JOHN H. REED
Member

/s/ LOUIS M. THAYER
Member

/s/ FRANCIS H. McADAMS
Member

Adopted: December 18, 1968

APPENDIX I

Severity of Impact Felt by Bus and Passenger Car

The maximum severity of the impact which could be felt by each of the vehicles can be estimated in terms of changes of velocity experienced by each vehicle. The crash was almost directly head-on. The aspect of impact felt by the bus passengers was predominantly forward in the car impact phase. The velocity change in direct head-on crash can be calculated on an idealized basis and the results will give maximum values slightly higher than those actually experienced.

The principle of conservation of momentum would apply. This principle is that the total momentum of both vehicles after impact is the sum of the momentum of each before impact. Expressed as an equation:

(Weight of bus) X (Speed of bus) + (Weight of car) X (Speed of car) =

(Weight of both vehicles) X (Speed after impact for both vehicles).

For this purpose an eastward velocity is considered plus and a westward velocity is minus.

$(M_1V_1)+(M_2V_2)=M_fV_f$

M_1 = Estimated weight of bus and passengers		33, 000*
V_1 = Estimated speed of bus at impact	plus	25 m. p. h. *
M_2 = Estimated weight of automobile and driver		3, 750*
V_2 = Estimated speed of automobile at impact	minus	53 m. p. h. *

*All figures rounded.

$(33,000)(25) - (3,750)(53) = M_fV_f$

$825 \times 10^3 - 198.75 \times 10^3 = 3,675 \times 10^3 V_f$

$626.25 = 36.75V_f$

Final speed of both vehicles - $V_f = 17.0$ m. p. h.

This means that in the impact, the speed of the bus was reduced from about 25 m. p. h. to about 17 m. p. h., a reduction of only 8 m. p. h.

From the standpoint of velocity change felt by most passengers, this reduction is to be compared with an impact against an unyielding object at 8 m.p.h. The car on the other hand, had its speed changed from about minus 53 m.p.h. to plus 17 m.p.h. The car was stopped instantly, then driven back in the opposite direction, so that its speed was changed by a total of about 70 m.p.h.

This approximation is in general agreement with the observations. The car was pushed 43 feet backward from the point of impact. This idealized calculation is subject to many modifications but it indicates reliably that the reduction in forward bus speed caused by the original impact could not have exceeded 8 m.p.h.

APPENDIX 2

SUMMARY

State of California

Wrong-Way Driving Reports [1/]

These reports describe wrong-way driving on California freeways and expressways. For three separate 9-month periods, data was collected and analyzed to determine the effectiveness of preventive measures (special signs and pavement arrows) installed on freeways and expressways. The before-and-after study method was used, giving consideration to both wrong-way driving incidents and accidents. In addition, 168 wrong-way drivers were interviewed, and biographical data is presented.

The relative safety of various types of off-ramps was measured, and average rates of wrong-way entry are given.

The study indicated the following:

1. Statewide, the remedial measures reduced wrong-way driving 60 percent on freeways and 70 percent on expressways.
2. More importantly, the measures reduced wrong-way driving accidents although to a lesser degree than wrong-way driving per se, 40 percent on freeways and 37 percent on expressways.

1/ State of California Department of Public Works, Transportation Agency, Reports on Wrong-Way Driving, Phases I, II, and III. Prepared in cooperation with DOT, FHWA.

3. The measures were more effective in reducing the more severe accidents than the property-damage-only accidents. First year estimates indicate that 90 lives were saved, 240 injuries prevented, and 140 accidents prevented.

4. The special red retro-reflective pavement arrow was of no benefit.

5. Wrong-way entry rates by interchange types where all possible movements to and from the roadway were provided are:

Interchange Type	Wrong-Way Entry Rate (Incidents per 100 Ramp Years) 2/
Four-Quad Cloverleaf	2.00
Buttonhook	4.12
Two-Quad Cloverleaf	4.91
Diamond	7.46
Trumpet	17.75

6. One hundred and sixty-eight wrong-way drivers were interviewed. The driving record, felony conviction record, medical and mental histories of these drivers, and of an additional 136 drivers involved in previous wrong-way driving accidents, were examined. It was

---

2/ Ramp Year = $D_1 + D_2 + D_3 + \ldots\ldots + D_n$

Where: D_1 = Days of Observation at Ramp #1

D_2 = Days of Observation at Ramp #2

D_3 = Days of Observation at Ramp #3

D_n = Days of Observation at Ramp #n

and 365 days in 1 year.

found that, typically, the wrong way driver is not handicapped physically or mentally. However, he receives considerably more driving violation convictions and felony convictions than the average motorist. He is also involved in considerably more accidents of all types.

Those wrong-way drivers who were also involved in wrong-way driving accidents were found to have an even greater disregard for criminal laws than wrong-way drivers in general.

7. Since many of the at-fault drivers in wrong-way accidents, especially the more severe accidents, have been drinking, and since it is generally assumed that the drinking driver is more difficult to influence, there was some concern that the preventive measures might not be too effective in reducing wrong-way driving by drinking motorists. The rate of wrong-way driving, however, was decreased to almost the same degree at night for the sober and for the drinking driver. During daylight hours, however, the drinking driver incident rate was decreased to a substantially greater degree (70 percent vs. 57 percent).

APPENDIX 3

U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
WASHINGTON, D.C. 20235

February 9, 1967

INSTRUCTIONAL MEMORANDUM 21-6-67
47-54.1

SUBJECT: Signs and Pavement Markings to Avert or Redirect Wrong-Way Traffic Movements

Reports recently made available have shown that it is necessary to emphasize and broaden signing and marking practices for averting or redirecting wrong-way traffic movements. In view of the serious nature of the wrong-way problem, it is concluded that the Bureau should take steps to implement the installation of signs and pavement markings with no unreasonable delay. Accordingly, please advise the States that we recommend the installation of additional signs and markings as described below and illustrated in the enclosed sketches. All locations should be investigated as soon as possible and necessary corrective action taken.

It is recognized that in part these recommendations include signs (white on red, WRONG WAY signs) for which national standards attained through the Manual on Uniform Traffic Control Devices have not fully been developed. Since additional corrective action needed is generally obvious, we recommend that it be done promptly without prejudice to future MUTCD determinations.

1. Freeway and Expressway Exit Ramps (See Sketch A)

   a) ONE WAY signs, Turn Prohibition signs, and sign assemblies consisting of a DO NOT ENTER sign above a WRONG WAY sign should be placed where an exit ramp intersects a crossroad in a manner that may invite wrong-way entry.

   b) In addition, WRONG WAY signs desirably should be placed at locations along an exit ramp farther from the crossroad. Normally, such signs should be located about at the midpoint of the ramp length between noses, at least 200 feet or more removed from the crossroad terminal signs.

   c) One or more arrow pavement markings also should be placed in each lane of an exit ramp near the crossroad terminal, at a location where it would clearly be in sight of a wrong-way driver.

2. Freeway and Expressway Entrance Ramps (See Sketch B)

a) A ONE WAY sign visible to traffic on the entrance ramp should be placed on the side of the through roadway opposite to the entrance ramp. A NO TURNS sign may also be in place along the through lanes just in advance of an entrance ramp terminal.

b) Route markers and directional signs, adequate in size and suitably positioned (overhead if necessary), shall be in place at an intersection of an entrance ramp and a crossroad. FREEWAY ENTRANCE signs have met with some success in one State and may be used to supplement these guide signs.

3. Roadways of Divided Highways having At-Grade Intersections (See Sketch C)

a) ONE WAY signs should be in place visible to each crossroad approach at the far left position for the first roadway and at the far right position for the second roadway, if a divided highway has a median 50 feet or more in width. For lesser width their use is optional.

b) A sign assembly consisting of a DO NOT ENTER sign above a WRONG WAY sign may be placed on the right side of a divided highway roadway, at a location to be directly in view of a driver making a wrong-way entry from the crossroad. The same sign assembly may also be placed on the left side of the divided highway roadway where the median width is such that the sign assembly is about 40 feet or more from the left edge of the opposite roadway.

c) In addition, WRONG WAY signs may be placed at other locations removed from the intersection, along the right side of a roadway of a divided highway. These signs may also be placed on the left side of a divided highway roadway at selected locations of sufficient median width as above described.

d) Arrow pavement markings may be placed in each lane of a roadway of a divided highway in advance of a crossroad and/or at other selected locations.

4. Use of Raised, Reflectorized Pavement Markers

Raised, reflectorized pavement markers may be used to form arrow markings and to supplement lane lines. Monodirectional markers should be red as viewed by wrong-way drivers. Bidirectional markers should be white as viewed in the direction of traffic, and red, as viewed by wrong-way drivers.

5. Design of WRONG WAY signs and FREEWAY ENTRANCE signs

WRONG WAY signs should be reflectorized and should have a white legend in two lines and a white border on a red background. Where used in an assembly, they are to be equal in width to the DO NOT ENTER sign. Where installed separately, they are to be a minimum of 36" x 24". FREEWAY ENTRANCE signs, if used, shall be reflectorized and shall have a white legend in two lines and a white border on a green background. A 36" x 24" size usually will be adequate.

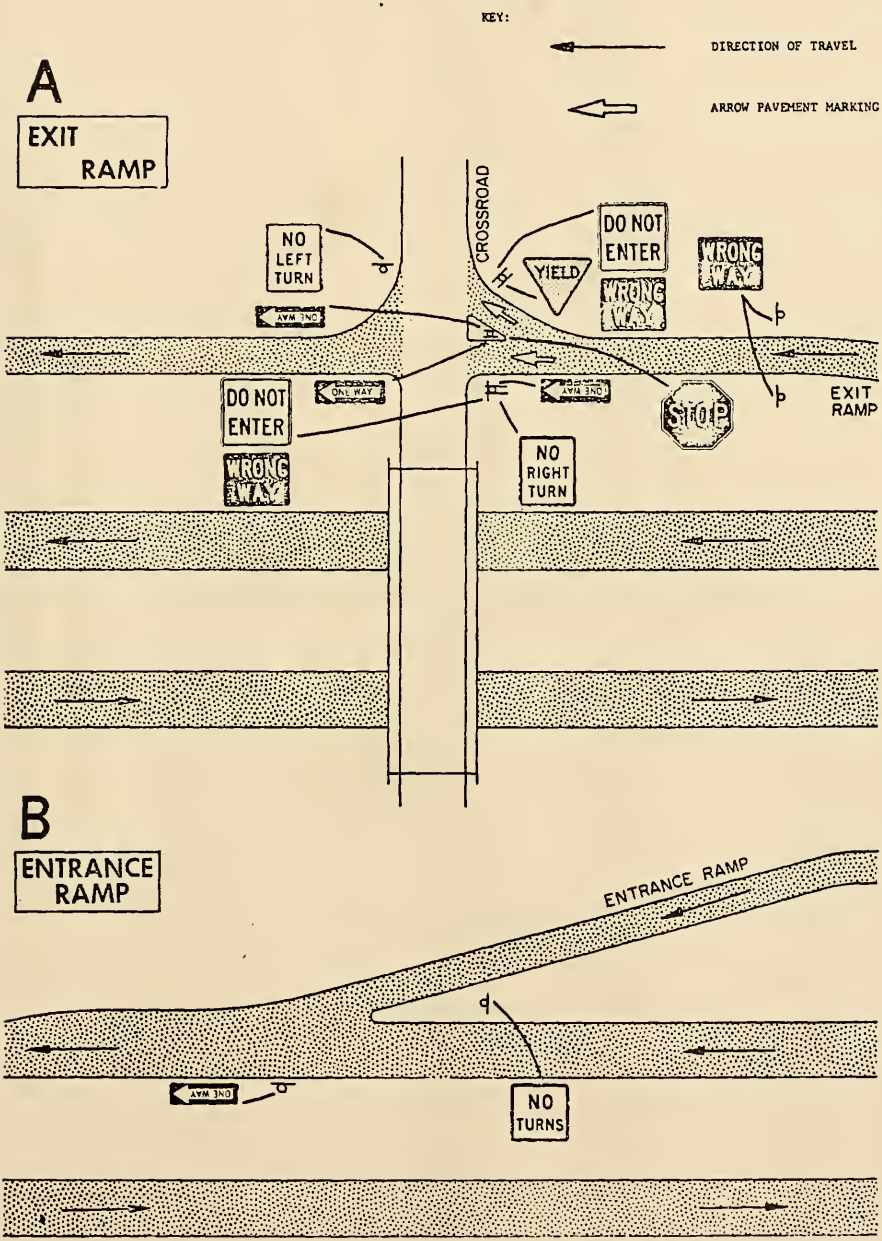
6. Participation with Federal-aid Funds

Federal-aid highway funds may be used to provide the signs and markers considered necessary to alleviate the hazard of wrong-way movements on projects currently under construction and those proposed for the future. Federal-aid funds also may be used to provide the signs and markers along existing facilities when projects of sufficient scope are presented to assure reasonably efficient and economical project administration. See PPM 21-15.

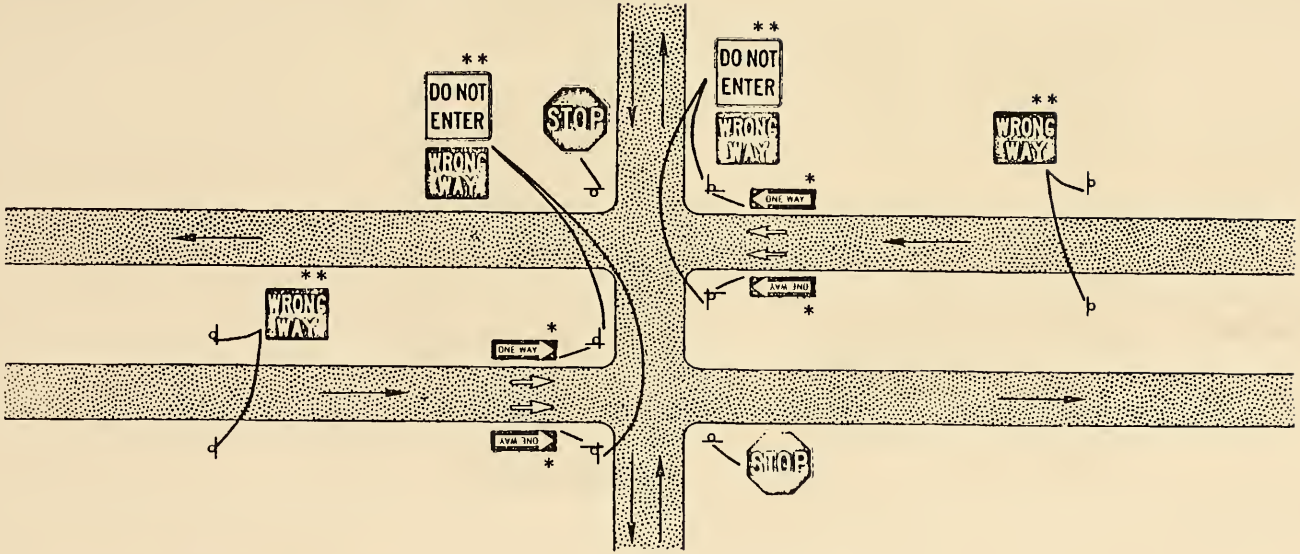
F. C. Turner
Acting Federal Highway
Administrator

Enclosure

TYPICAL REGULATORY SIGNING AND ARROW MARKINGS AT RAMP TERMINALS



C TYPICAL REGULATORY SIGNING AND ARROW MARKINGS AT DIVIDED HIGHWAY INTERSECTIONS



* SHOULD BE USED IF MEDIAN WIDTH IS 50 FEET OR MORE

* * MAY ONLY BE USED IN MEDIAN IF SIGNS ARE AT LEAST 40 FEET FROM EDGE OF OPPOSITE ROADWAY

HAS ALCOHOL AFFECTED YOUR DRIVING ABILITY?

The % of alcohol in your blood will tell you. This % can be estimated by—COUNTING YOUR DRINKS (1-drink equalling 1 volume oz. of 100 proof alcohol or 1-12 oz. bottle of beer).

Use Blood Alcohol Chart below. Under number of DRINKS and opposite Body-Weight find the % of Blood-Alcohol listed

SUBTRACT from this number the % of alcohol "burned up" during the time elapsed since your first drink.

No. Hours Since 1st Drink	1	2	3	4	5	6
SUBTRACT	.015%	.030%	.045%	.060%	.075%	.090%

Example—180 lb. man - 8 drinks in 4 hours
.167% minus .060% = .107%

THIS REMAINDER IS AN ESTIMATE of the % of alcohol in your blood.

INTERPRETATION OF RESULTS

% OF BLOOD-ALCOHOL	INTOXICATED?	IF YOU DRIVE A CAR—
.000 to .050	You Are Not	Take It Easy
.050 to .100	You May Be	Use Extreme Caution
.100 to .150	You Probably Are	Better Not
.150 and above	YOU ARE	DON'T—YOU'VE HAD IT

FOR BEST RESULTS—DON'T DRINK AND DRIVE

BLOOD-ALCOHOL CHART

SHOWING ESTIMATED % OF ALCOHOL IN THE BLOOD
BY NO. OF DRINKS IN RELATION TO BODY WEIGHT

BODY WEIGHT	DRINKS 1	2	3	4	5	6	7	8	9	10	11	12
100 lb.	.033	.075	.113	.150	.188	.225	.263	.300	.338	.375	.413	.450
120 lb.	.031	.063	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375
140 lb.	.027	.054	.080	.107	.134	.161	.188	.214	.241	.268	.295	.321
160 lb.	.023	.047	.070	.094	.117	.141	.164	.188	.211	.234	.258	.281
180 lb.	.021	.042	.063	.083	.104	.125	.146	.167	.188	.208	.229	.250
200 lb.	.019	.038	.056	.075	.094	.113	.131	.150	.169	.188	.206	.225
220 lb.	.017	.034	.051	.068	.085	.102	.119	.136	.153	.170	.188	.205
240 lb.	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188

Government of the District of Columbia
DEPARTMENT OF MOTOR VEHICLES
Office of Traffic Safety Education

12/64—3CM

APPENDIX 5

Uniform Vehicle Code

Implied Consent

Pages 69 and 70

Section 6-205.1-Revocation of license in event of refusal to submit to chemical tests[28a]

(a) Any person who operates a motor vehicle upon the public highways of this State shall be deemed to have given consent, subject to the provisions of section 11-902, to a chemical test or tests of his blood, breath, or urine for the purpose of determining the alcoholic content of his blood if arrested for any offense arising out of acts alleged to have been committed while the person was driving or in actual physical control of a motor vehicle while under the influence of intoxicating liquor. The test or tests shall be administered at the direction of a law enforcement officer having reasonable grounds to believe the person to have been driving or in actual physical control of a motor vehicle upon the public highways of this State while under the influence of intoxicating liquor. The law enforcement agency by which such officer is employed shall designate which of the aforesaid tests shall be administered.

(b) Any person who is dead, unconscious or who is otherwise in a condition rendering him incapable of refusal, shall be deemed not to have withdrawn the consent provided by paragraph (a) of this section and the test or tests may be administered, subject to the provisions of section 11-902.

(c) If a person under arrest refuses upon the request of a law enforcement officer to submit to a chemical test designated by the law enforcement agency as provided in paragraph (a) of this section, none shall be given, but the department, upon the receipt of a sworn report of the law enforcement officer that he had reasonable grounds to believe the arrested person had been driving or was in actual physical control of a motor vehicle upon the public highways of this State while under the influence of intoxicating liquor and that the person had refused to submit to the test upon the request of the law enforcement

[28a]Generally known as the "implied consent law." A State contemplating the enactment of this section should refer also to sections 11-902, 11-902.1, 6-208 and 1-155.

officer, shall revoke his license or permit to drive, or any nonresident operating privilege; or if the person is a resident without a license or permit to operate a motor vehicle in this State, the department shall deny to the person the issuance of a license or permit for a period of six months after the date of the alleged violation, subject to review as hereinafter provided.

(d) Upon revoking the license or permit to drive or nonresident operating privilege of any person, or upon determining that the issuance of a license or permit shall be denied to the person, as hereinbefore in this section directed, the department shall immediately notify the person in writing and upon his request shall afford him an opportunity for a hearing in the same manner and under the same conditions as is provided in section 6-206(b) for notification and hearings in the cases of discretionary suspension of licenses, except that the scope of such a hearing for the purposes of this section shall cover the issues of whether a law enforcement officer had reasonable grounds to believe the person had been driving or was in actual physical control of a motor vehicle upon the public highways of this State while under the influence of intoxicating liquor, whether the person was placed under arrest, and whether he refused to submit to the test upon request of the officer. Whether the person was informed that his privilege to drive would be revoked or denied if he refused to submit to the test shall not be an issue. The department shall order that the revocation or determination that there should be a denial of issuance either be rescinded or sustained.

(e) If the revocation or determination that there should be a denial of issuance is sustained after such a hearing, the person whose license or permit to drive or nonresident operating privilege has been revoked, or to whom a license or permit is denied, under the provisions of this section, shall have the right to file a petition in the appropriate court to review the final order of revocation or denial by the department in the same manner and under the same conditions as is provided in section 6-211 in the cases of discretionary revocations and denials.

(f) When it has been finally determined under the procedures of this section that a nonresident's privilege to operate a motor vehicle in this State has been revoked, the department shall give information in writing of the action taken to the motor vehicle administrator of the state of the person's residence and of any state in which he has a license. (NEW SECTION, 1962)

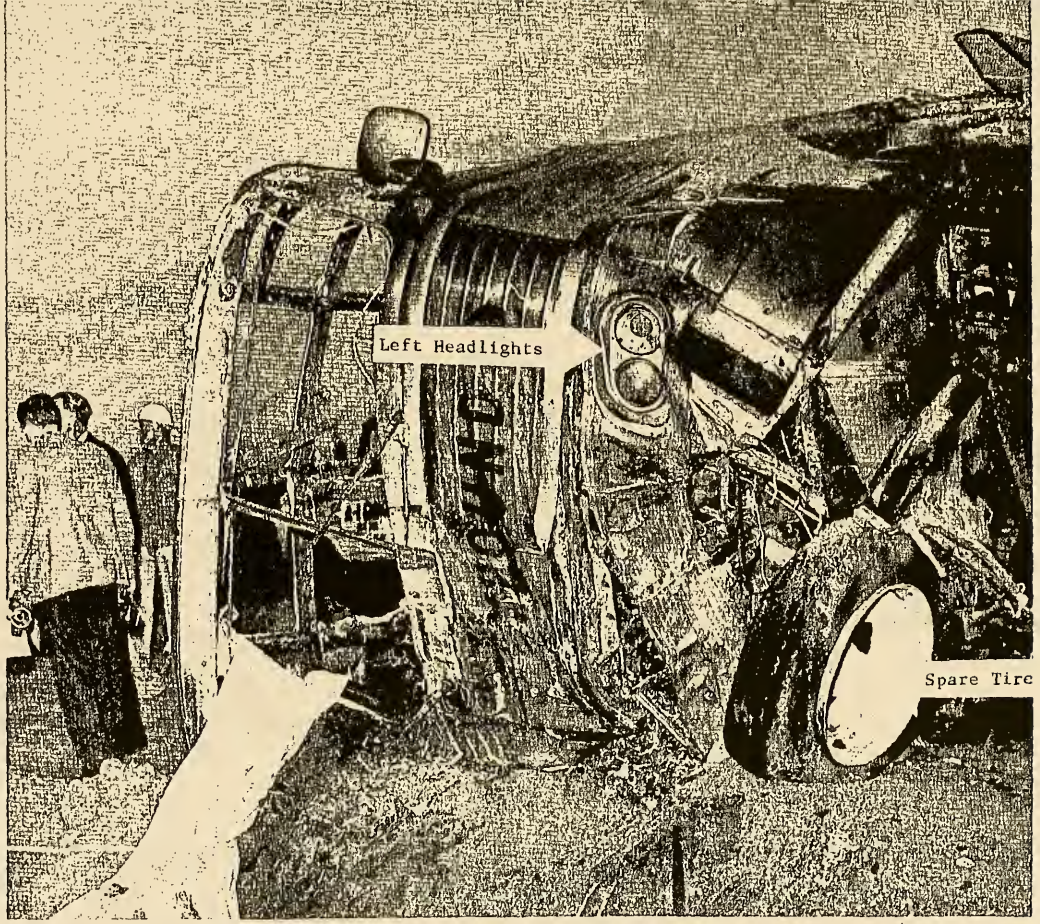
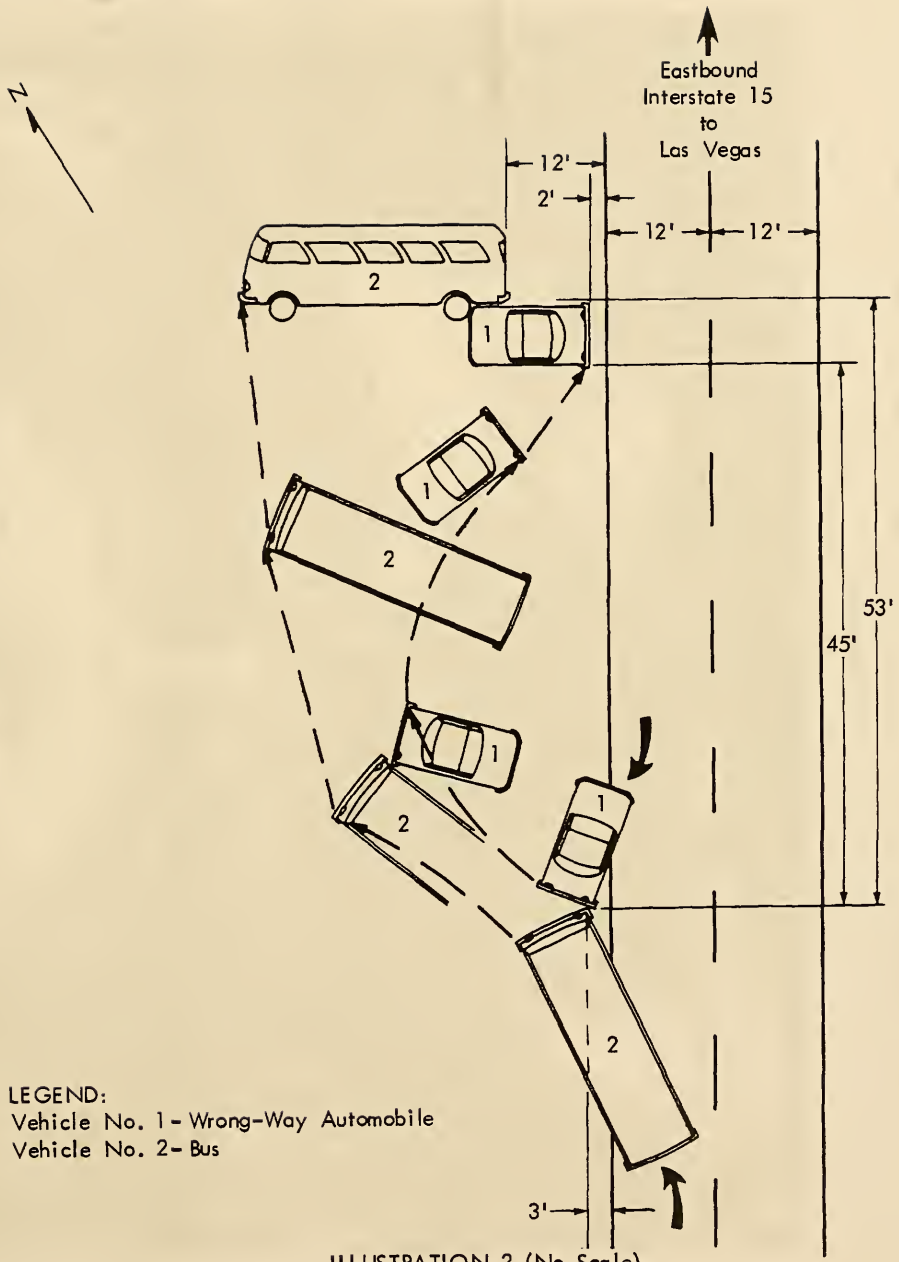


ILLUSTRATION 1

Damage to front of bus from left headlights through right front corner.



LEGEND:
Vehicle No. 1 - Wrong-Way Automobile
Vehicle No. 2 - Bus

ILLUSTRATION 2 (No Scale)

Accident diagram showing relative vehicle position during collision and post-collision phases of accident.

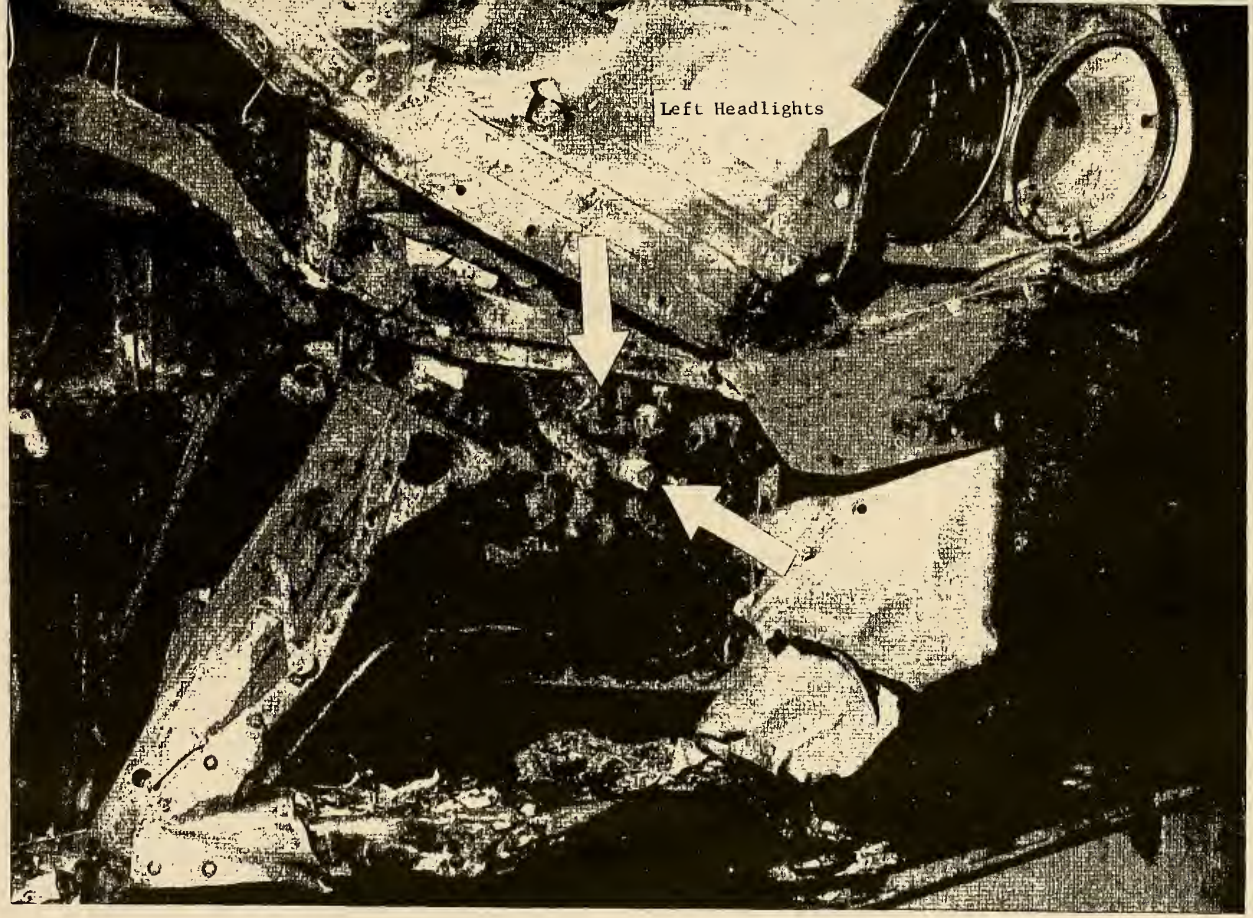
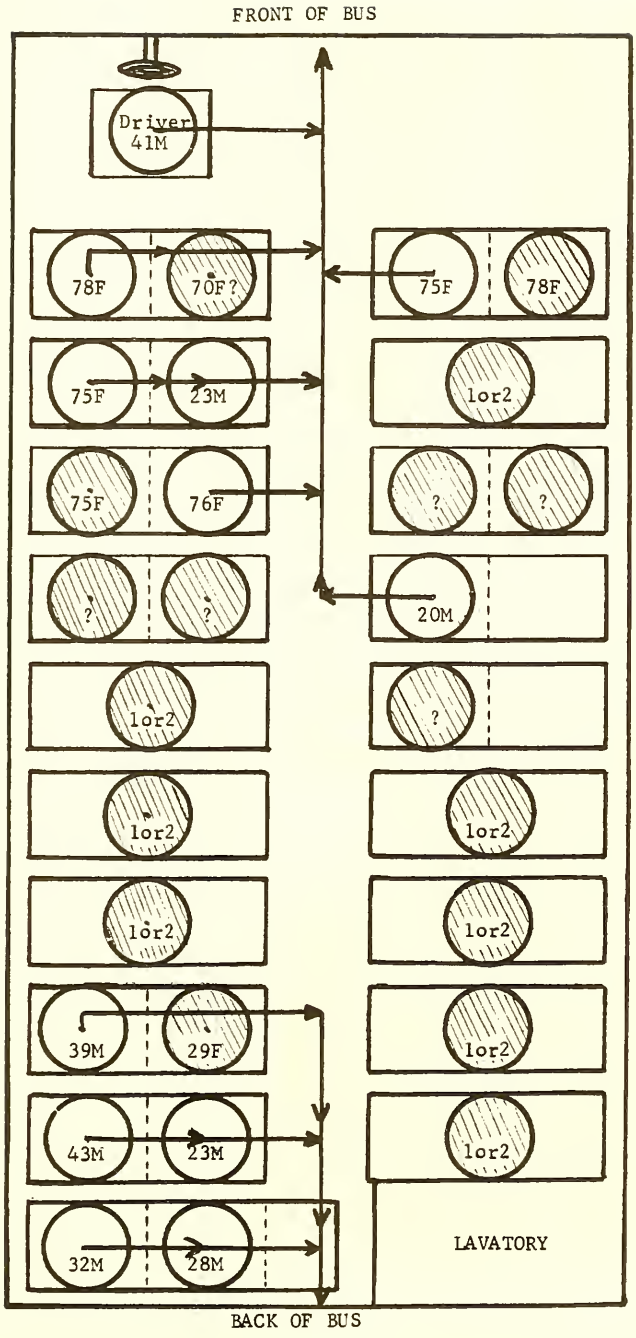


ILLUSTRATION 3

Power steering fluid fitting. Arrows point to severed power steering fluid line.



KNOWN AND DEDUCED SEATING LOCATIONS, AGES AND SEX OF BUS OCCUPANTS

31 OCCUPANTS

19 DECEASED

12 SURVIVORS

FATALITY

The Arrow indicates the escape route of the survivors.

(Diagram not to scale.)

ILLUSTRATION 4

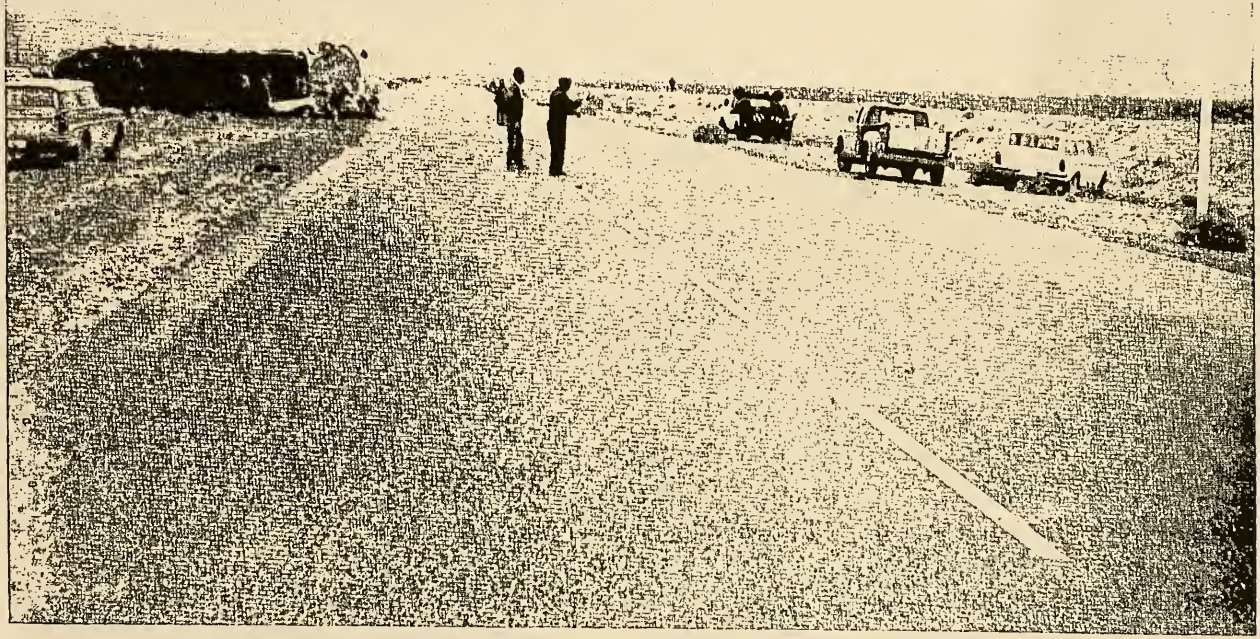


ILLUSTRATION 5

Interstate 15 looking east from accident site. Visibility is without practical limitations

ILLUSTRATION 6

Interstate 15 looking west from accident site. Visibility is without practical limitations.

ILLUSTRATION 7

Baker interchange. Entrance to eastbound Interstate 15 (Las Vegas) is on right. Exit from westbound Interstate 15 to Baker is on left. Note Keep Right, Wrong-Way and Do Not Enter signs and centerline pavement markings. A white directional arrow is in place on the roadway pavement.

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Technical Information Service
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